CLAIMS

1. Wireless data communication method between a transmitter device (2) having a first wide band antenna (27) for transmitting ultra wide band encoded data signals (S_D), and a receiver device (3) having a second wide band antenna (37) for receiving direct path and/or multiple path encoded data signals, the transmitted data being defined by one or more sequences of N pulses where N is an integer number higher than 1, the arrangement of N pulses of each sequence representing encoding of data relating to the transmitter device, characterized in that the N pulses of one pulse sequence of direct path and/or multiple path encoded data signals received by the receiver device are each processed in one of N corresponding temporal reception windows, each of the N temporal reception windows being positioned in time as a function of a known theoretical arrangement of the N pulses of the signals transmitted by the transmitter device, and in that an operation (51) of adding the N windows is carried out in the receiver device so that the added pulse amplitude level is higher than the noise amplitude level picked up by the receiver device.

2. Communication method according to claim 1, characterized in that a clock signal frequency (CLK_r) for clocking various operations of the receiver device (3) is proportionally adapted to a reference clock signal frequency (CLK_e) of the transmitter device, which is used for generating ultra-wide band encoded data signals, by controlling the pulse amplitude level of a final window adding the N windows until said amplitude level is maximised.

3. Communication method according to claim 1, characterized in that the transmitter device (2) transmits encoded data signals (S_D), in which the data is encoded by pulse position modulation of each sequence, or by pulse polarity or phase modulation of each sequence, or by pulse position and polarity modulation of each sequence.

4. Communication method according to claim 1, characterized in that the encoded data signals (S_D) include a synchronisation frame allowing the receiver device to recognise the transmitter device and to be synchronised on said frame before demodulating the received data, said synchronisation frame being composed of one or several sequences of N pulses of determined pulse repetition frequency.

5. Communication method according to claim 1, characterized in that the identical width of each of the N temporal windows is smaller than the reverse of the mean pulse repetition frequency of a sequence of encoded data signals to be transmitted, and in that said temporal window width is adapted to receive the pulses of

the direct and multiple path signals picked up by the receiver device, for example of width greater than 20 ns.

6. Communication method according to claim 1, wherein the transmitter device (2) includes a first oscillator stage (21) delivering at least one first clock signal at a first defined frequency (CLK_e), a first signal processing unit (23) clocked by the clock signal provided by the first oscillator stage in order to modulate data to be transmitted, and a unit for shaping the N pulses (24) of each sequence to be transmitted by the first wide band antenna (27) of the transmitter device as a function of the data modulation provided by the first signal processing unit, and wherein the receiver device (3) includes a second oscillator stage (31) delivering at least one second clock signal at a second defined frequency (CLK_r), a second signal processing unit (33) connected to the second oscillator stage, and an analogue-digital conversion stage (34) for analogue signals relating to the encoded data signals received by the second wide band antenna (37), characterized in that an operation of adding the N temporal windows is performed before (45) or after (41) the analogue-digital conversion of the analogue signals, and in that the analogue signal pulses are sampled in the analogue-digital conversion stage by at least one sampling signal (CLK_{1-n}) supplied by the second signal processing unit (33), the sampling signal having a frequency proportional to the second frequency of the second clock signal.

7. Communication method according to claim 6, characterized in that the temporal window signals are successively added and stored in at least one register of the second signal processing unit.

8. Communication method according to claim 2, characterized in that each reception window positioned in time in relation to the known theoretical place of each pulse of the received data signals is centred relative to a theoretical reference value or relative to the maximum added pulse amplitude of the direct path and/or multiple path signals picked up by the receiver device.

9. Communication method according to claim 3, characterized in that the reference signals of identical polarity to the polarity of the encoded signals received by the receiver device are correlated prior to addition of the resulting pulses of each temporal window.

10. Communication method according to claim 6, wherein the second signal processing unit (33) includes means for adding the digital windows (41) and means for estimating the time of arrival (44) of the encoded data signals, characterized in that before or after the temporal window addition operation, the method includes steps consisting in calculating several absolute value maximum amplitude values (A_i) for signals in temporal sub-windows of defined length T_N, each of the sub-windows being

time shifted in relation to each other by a determined time interval from the start of the temporal reception window to the end of said temporal window, and in estimating a noise amplitude level by selecting the minimum amplitude value from all the calculated amplitude values.

11. Communication method according to claim 6, characterized in that it includes steps for calculating a positive envelope of the signals of one temporal window consisting in determining all the zero crossing positions p_i of the temporal window signals, in determining the coordinates (x_i, y_i) of the absolute value amplitude maximum in each interval from p_i to p_{i+1}, with i ranging from 1 to I-1, I being an integer number higher than 3, and in calculating the envelope by using a specific interpolation algorithm passing through the determined coordinates.

12. Communication method according to claim 11, characterized in that it includes steps for calculating the time of arrival of the first signals picked up by the receiver device consisting in calculating an amplitude threshold th based on the amplitude maximum (A_P) of the envelope, and an estimated noise amplitude level (A_N), in estimating the rising edge of the positive envelope where the threshold th is exceeded for the first time, in estimating the maximum local point of the envelope at the coordinates (x_M, y_M) which directly follow the point where the envelope passes above the threshold th, and the minimum local point of the envelope at the coordinates (x_m, y_m) which precede the point where the envelope passes above the threshold th, in calculating the intermediate coordinates between the minimum point and the maximum point, in approximating at the position of intermediate coordinates a selected segment of samples of the envelope with given function, such as a linear function, and in determining the time of arrival of the first signals picked up by the receiver device at the zero crossing or another value of the determined function.

13. Communication method according to claim 6, wherein the second signal processing unit includes control means (43) for providing control signals (C_{FN}) to digital window addition means (41) in order to modify the time or mean repetition frequency scale of N windows to be added from digital window addition means (41), characterized in that a re-sampling operation is carried out in the second signal processing unit (33) of the receiver device (3) with a different re-sampling frequency from the sampling frequency of the analogue-digital conversion stage (34), said re-sampling frequency generated by the control means being able to be higher than the sampling frequency in order to increase precision for positioning purposes.

14. Receiver device (3) for implementing the communication method according to any of the preceding claims, including an oscillator stage (31) delivering at least one clock signal at a defined frequency (CLK_r), a signal processing unit (33)

connected to the oscillator stage, and an analogue-digital conversion stage (34) for the encoded data signals received by a wide band antenna (37), characterized in that the signal processing unit includes temporal window addition means (41, 45) for coherently adding up the pulses of each of the N temporal windows.

15. Receiver device (3) according to claim 14, characterized in that the clock signal frequency (CLK_r) of the oscillator stage (31) is proportionally adapted by the processing unit (33) to a reference clock signal frequency (CLK_e) of an oscillator stage (21) of the transmitter device, which is used for generating ultra-wide band encoded data signals, by controlling the pulse amplitude level of a final addition window of the N windows from the addition means (41, 45) until said amplitude level is maximised.

16. Receiver device (3) according to claim 14, characterized in that the temporal window addition means (41) receive digital signals (S_{NUM}) from the analogue-digital conversion stage for adding up the digital windows.

17. Receiver device (3) according to claim 14, characterized in that the temporal window addition means (45) receive analogue data signals from the second wide band antenna (37) in order to add up the analogue windows.